Gravatt, Dan

From: Nold, Eric
Sent: Thursday, June 19, 2014 1:55 PM
To: Gravatt, Dan
Subject: FW: Siting Criteria
Attachments: probehieght.pdf

fyi

From: Grooms, Leland
Sent: Wednesday, June 18, 2014 8:36 AM
To: Nold, Eric
Subject: Siting Criteria

Hi Eric

Please see attached information as it pertains to required intake height on the air monitors.

Leland

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of the components, use the following calculation:

$$V = pi * (d/2)^2 * L$$

Where:
V = volume of the component, cm^3
pi = 3.14159
L = Length of the component, cm
d = inside diameter, cm

Once the total volume is determined, divide the volume by the flow rate of all instruments. This will give the residence time.

It has been demonstrated that there are no significant losses of reactive gas (O_3) concentrations in conventional 13 mm inside diameter sampling lines of glass or Teflon if the sample residence time is 10 seconds or less. This is true even in sample lines up to 38 m in length, which collect substantial amounts of visible contamination due to ambient aerosols. However, when the sample residence time exceeds 20 seconds, loss is detectable, and at 60 seconds the loss is nearly complete.

The air flow through the manifold must not be so great as to cause the pressure inside the manifold to be more than one inch of water below ambient. These last two conditions are in opposition to each other, but can be assessed as follows. Construct the manifold. Use a pitot tube to measure the flow of the sample inside the manifold. At the same time, attach a water manometer to a sampling port. Turn on the blower and measure the flow rate and the vacuum. (Remember to allow for the air demand of the instrumentation). Adjust the flow rate to fit between these two parameters. If this is impossible, the diameter of the manifold is too small.

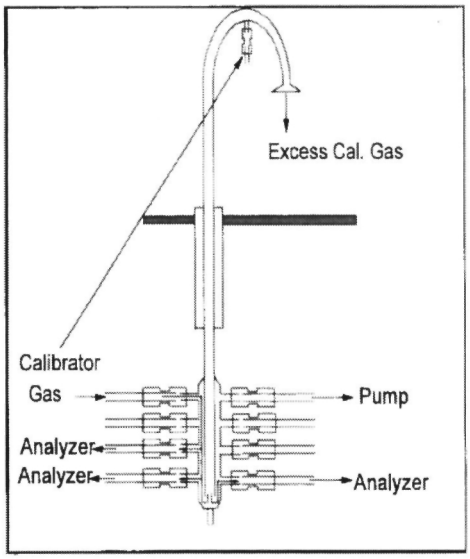

Figure 7.4 Positions of calibration line in sampling manifold

Placement of tubing on the Manifold: If the manifold that is employed at the station has multiple ports then placement of the instrument lines can be crucial. If a manifold similar to Figure 7.4 is used ambient air flows down the center tube and then travels up on both sides of the manifold to the analyzer ports. It is suggested that instruments requiring lower flows be placed towards the bottom of the manifold. The general rule of thumb states that the calibration line (if used) placement should be in a location so that the calibration gases flow past the instruments before the gas is evacuated out of the manifold. Figure 7.4 illustrates two potential introduction ports for the calibration gas. The port at the elbow of the sampling cane provides more information about the cleanliness of the sampling system.

7.3.2 Placement of Probes and Manifolds

Probes and manifolds must be placed to avoid introducing bias to the sample. Important considerations are probe height above the ground, probe length (for horizontal probes), and physical influences near the probe.

Some general guidelines for probe and manifold placement are:

- probes should not be placed next to air outlets such as exhaust fan openings
- horizontal probes must extend beyond building overhangs
- probes should not be near physical obstructions such as chimneys which can affect the air flow in the vicinity of the probe
- height of the probe above the ground depends on the pollutant being measured

Table 7-3 summarizes the probe and monitoring path siting criteria while Table 7-4 summarizes the spacing of probes from roadways. This information can be found in 40 CFR Part 58, Appendix E[2]. For PM_{10} and $PM_{2.5}$, Figure 7.5 provides the acceptable areas for micro, middle, neighborhood and urban samplers, with the exception of microscale street canyon sites.

Table 7-3 Summary of Probe and Monitoring Path Siting Criteria

Pollutant	Scale (maximum monitoring path length, meters)	Height from ground to probe, inlet or 80% of monitoring path [1] (meters)	Horizontal and vertical distance from supporting structures[2] to probe, inlet or 90% of monitoring path[1] (meters)	Distance from trees to probe, inlet or 90% of monitoring path[1] (meters)	Distance from roadways to probe, inlet or monitoring path[1] (meters)
SO_2 [3,4,5,6]	Middle (300 m) Neighborhood Urban, and Regional (1 km).	2–15	> 1	> 10	N/A
CO [4,5,7]	Micro, Middle (300 m), Neighborhood (1 km).	3 ±1/2: 2–15	> 1	> 10	2–10; see Table 7 3 of this section for middle and neighborhood scales.
NO_2, O_3 [3,4,5]	Middle (300 m) Neighborhood, Urban, and Regional (1 km).	2–15	> 1	> 10	See Table 7-3 of this section for all scales.
Ozone precursors (for PAMS)[3,4,5]	Neighborhood and Urban (1 km)	2–15	> 1	> 10	
PM, Pb [3,4,5,6,8]	Micro: Middle, Neighborhood, Urban and Regional.	2–7 (micro); 2–7 (middle PM10-2.5); 2–15 (all other scales).	> 2 (all scales, horizontal distance only).	> 10 (all scales).	2–10 (micro); see Figure 7.3 of this section for all other scales

N/A—Not applicable.
[1] Monitoring path for open path analyzers is applicable only to middle or neighborhood scale CO monitoring and all applicable scales for monitoring SO_2,O_3, O_3 precursors, and NO_2.
[2] When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.
[3] Should be >20 meters from the dripline of tree(s) and must be 10 meters from the dripline when the tree(s) act as an obstruction.
[4] Distance from sampler, probe, or 90% of monitoring path to obstacle, such as a building, must be at least twice the height the obstacle protrudes above the sampler, probe, or monitoring path. Sites not meeting this criterion may be classified as middle scale (see text).
[5] Must have unrestricted airflow 270 degrees around the probe or sampler; 180 degrees if the probe is on the side of a building.
[6] The probe, sampler, or monitoring path should be away from minor sources, such as furnace or incineration flues. The separation distance is dependent on the height of the minor source's emission point (such as a flue), the type of fuel or waste burned, and the quality of the fuel (sulfur, ash, or lead content). This criterion is designed to avoid undue influences from minor sources.
[7] For microscale CO monitoring sites, the probe must be >10 meters from a street intersection and preferably at a midblock location.
[8] Collocated monitors must be within 4 meters of each other and at least 2 meters apart for flow rates > 200 liters/min and at least 1 meter for flow rates < 200 liters/min .

[2] http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40tab_02.tpl All references to CFR in following sections can be found at this site.